奇美電子 CHIMEI INNOLUX

PRODUCT SPECIFICATION

☐ Tentative Specification
■ Preliminary Specification
☐ Approval Specification

MODEL NO.: V315H3
SUFFIX: PE2

Customer:

APPROVED BY **SIGNATURE**

Name / Title _____ _____

Note

Please return 1 copy for your confirmation with your signature and comments.

Approved By	Checked By	Prepared By
Chao-Chun Chung	Vincent Chou	Samuel Huang

CONTENTS -

REVISION HISTORY

Version	Date	Page(New)	Section	Description
Ver. 1.0	Apr. 21, 2010	All	All	Preliminary specification was first issued.
Ver. 1.1	Aug. 13, 2010	4	1.2/1.3	Weight → 1180 g Modify color chromaticity R:(0.639, 0.327) → (0.654,0.324) G:(0.288, 0.603) → (0.293,0.599); B:(0.148, 0.048) → (0.312, 0.364); W: (0.280, 0.290) → (0.312, 0.364)
		11	5.1	Update pin 9 definition
			5.1	Remove notes for ODSEL pin
		19	6.1	Remove note6 for ODSEL pin
		20	6.2	Remove ODSEL from optional signal in power on/off diagram

1. GENERAL DESCRIPTION

1.1 OVERVIEW

V315H3- PE3 is a 31.5″ TFT Liquid Crystal Display module with 2ch-LVDS interface. This module supports 1920 x 1080 Full HDTV format and can display true 16.7M colors (8-bit/color).

1.2 CHARACTERISTICS

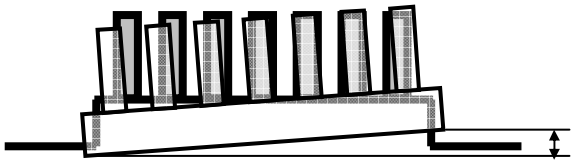
CHARACTERISTICS ITEMS	SPECIFICATIONS
Screen Diagonal [in]	31.51
Pixels [lines]	1920*1080
Active Area [mm]	698.4 (H) x 392.85 (V) (31.51″ diagonal)
Sub -Pixel Pitch [mm]	0.12125 (H) x 0.36375 (V)
Pixel Arrangement	RGB vertical stripe
Weight [g]	(1180)
Physical Size [mm]	716.1(W) x 410(H) x 1.79(D) Typ.
Display Mode	Transmissive mode / Normally Black
Contrast Ratio	6000:1 Typ. (Typical value measured at CMI's module)
Glass thickness (Array/CF) [mm]	0.7 / 0.7
Viewing Angle (CR>20)	+88/-88(H),+88/-88(V) Typ. (Typical value measured at CMI's module)
Color Chromaticity	R=(0.654, 0.324) G=(0.293, 0.599) B=(0.130, 0.115) W=(0.312, 0.364) (Typical value measured with C source)
Cell Transparency [%]	4.6% Typ. (Typical value measured at CMI's module)
Polarizer (CF side)	Glare coating, Hard coating (3H) 709.7(H) x 405(W)..
Polarizer (TFT side)	Super Wide View, 709.7(H) x 405(W)..

1.3 MECHANICAL SPECIFICATIONS

Item	Min.	Typ.	Max.	Unit	Note
Weight	-	(1180)	-	g	-
I/F connector mounting position	The mounting inclination of the connector makes the screen center within ±0.5mm as the horizontal.				(2)

Note (1) Please refer to the attached drawings for more information of front and back outline dimensions.

(2) Connector mounting position



2. ABSOLUTE MAXIMUM RATINGS

2.1 ABSOLUTE RATINGS OF ENVIRONMENT (BASED ON CMI MODULE V315H3-LE2)

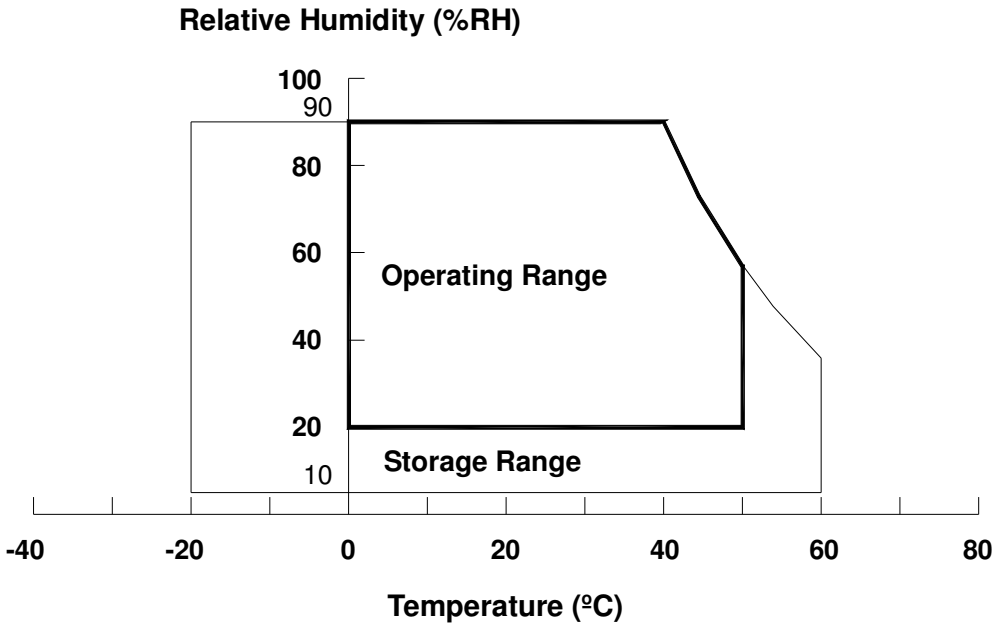
Item	Symbol	Value		Unit	Note
		Min.	Max.		
Storage Temperature	T_{ST}	-20	+60	°C	(1), (3)
Operating Ambient Temperature	T_{OP}	0	50	°C	(1), (2), (3)
Altitude Operating	A_{OP}	0	5000	M	(3)
Altitude Storage	A_{ST}	0	12000	M	(3)

Note (1) Temperature and relative humidity range is shown in the figure below.

(a) 90 %RH Max. (Ta ≦ 40 °C).

(b) Wet-bulb temperature should be 39 °C Max. (Ta > 40 °C).

(c) No condensation.



Note (2) The maximum operating temperature is based on the test condition that the surface temperature of display area is less than or equal to 65 °C with LCD module alone in a temperature controlled chamber. Thermal management should be considered in your product design to prevent the surface temperature of display area from being over 65 °C. The range of operating temperature may degrade in case of improper thermal management in your product design.

Note (3) The rating of environment is base on LCD module. Leave LCD cell alone, this environment condition can't be guaranteed. Except LCD cell, the customer has to consider the ability of other parts of LCD module and LCD module process.

2.2 ABSOLUTE RATINGS OF ENVIRONMENT (OPEN CELL)

Storage Condition : With shipping package.

Storage temperature range : 25±5 ℃

Storage humidity range : 50±10%RH

Shelf life : a month

2.3 ELECTRICAL ABSOLUTE RATINGS (OPEN CELL)

2.3.1 TFT LCD OPEN CELL

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Power Supply Voltage	Vcc	-0.3	13.5	V	(1)
Input Signal Voltage	V_{IN}	-0.3	3.6	V	

Note (1) Permanent damage to the device may occur if maximum values are exceeded. Function operation should be restricted to the conditions described under Normal Operating Conditions.

3. ELECTRICAL CHARACTERISTICS

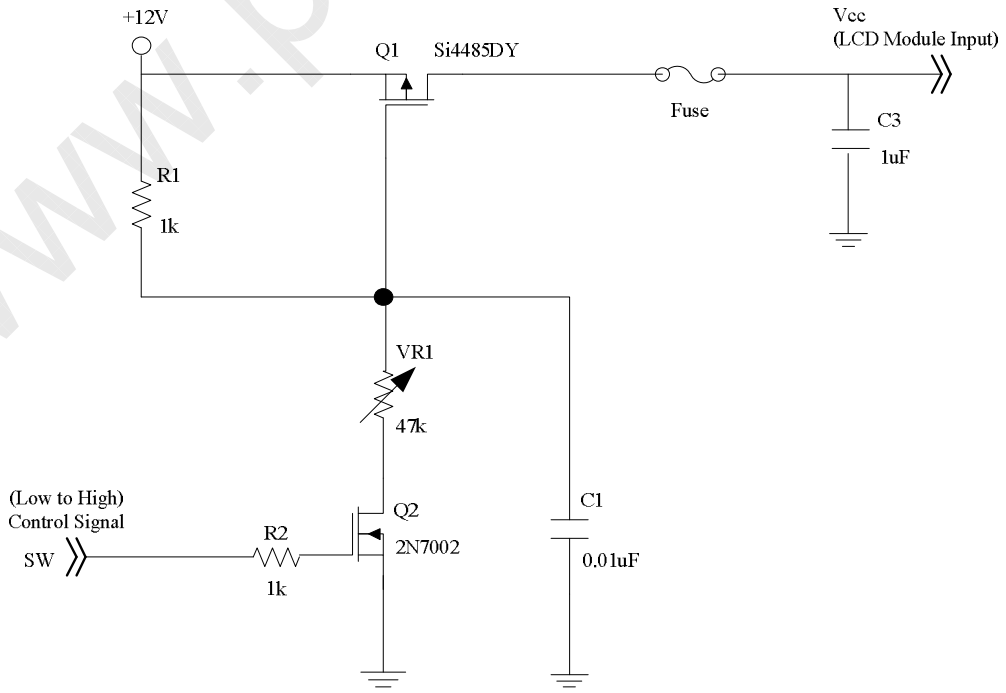
3.1 TFT LCD MODULE

(Ta = 25 ± 2 °C)

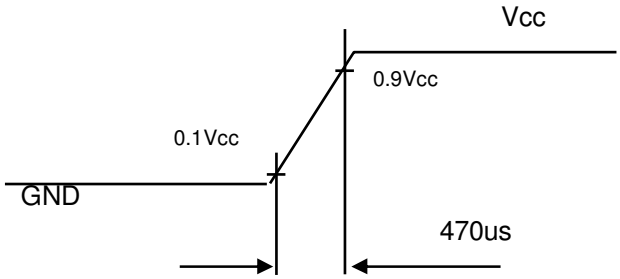
Parameter		Symbol	Value			Unit	Note
			Min.	Typ.	Max.		
Power Supply Voltage		V_{CC}	10.8	12	13.2	V	(1)
Rush Current		I_{RUSH}	–	–	2.7	A	(2)
Power Supply Current	White Pattern	–	–	0.58	–	A	(3)
	Black Pattern	–	–	0.44	–	A	
	Horizontal Stripe	–	–	0.58	0.62	A	
LVDS interface	Differential Input High Threshold Voltage	V_{LVTH}	+100	–	–	mV	(4)
	Differential Input Low Threshold Voltage	V_{LVTL}	–	–	-100	mV	
	Common Input Voltage	V_{CM}	1.0	1.2	1.4	V	
	Differential input voltage (single-end)	$\|V_{ID}\|$	200	–	600	mV	
	Terminating Resistor	R_T	–	100	–	ohm	
CMOS interface	Input High Threshold Voltage	V_{IH}	2.7	–	3.3	V	
	Input Low Threshold Voltage	V_{IL}	0	–	0.7	V	

Note (1) The module should be always operated within the above ranges.

Note (2) Measurement condition:

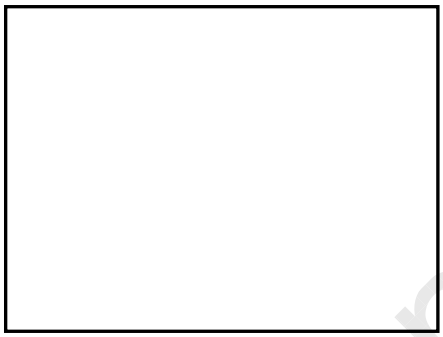


Vcc rising time is 470us



Note (3) The specified power supply current is under the conditions at Vcc = 12 V, Ta = 25 ± 2 °C, f_v = 60 Hz, whereas a power dissipation check pattern below is displayed.

a. White Pattern

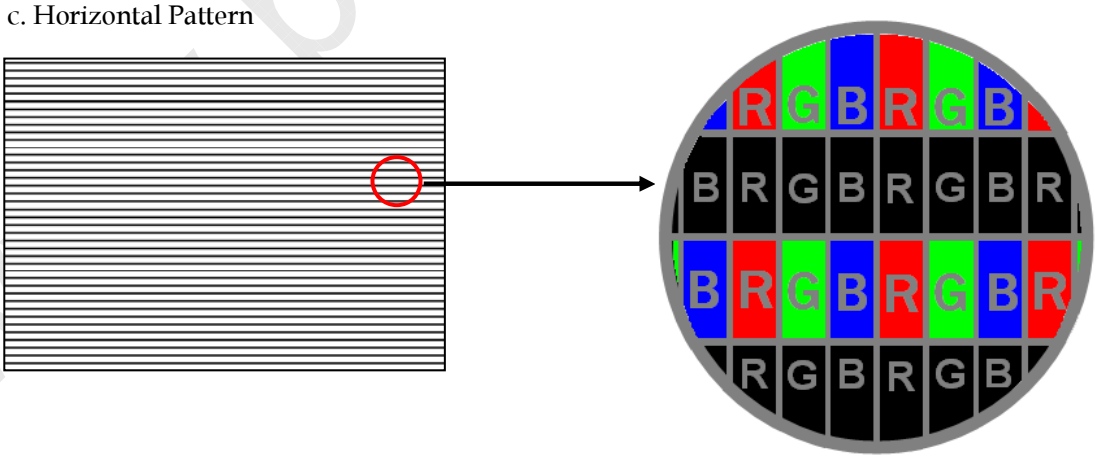


Active Area

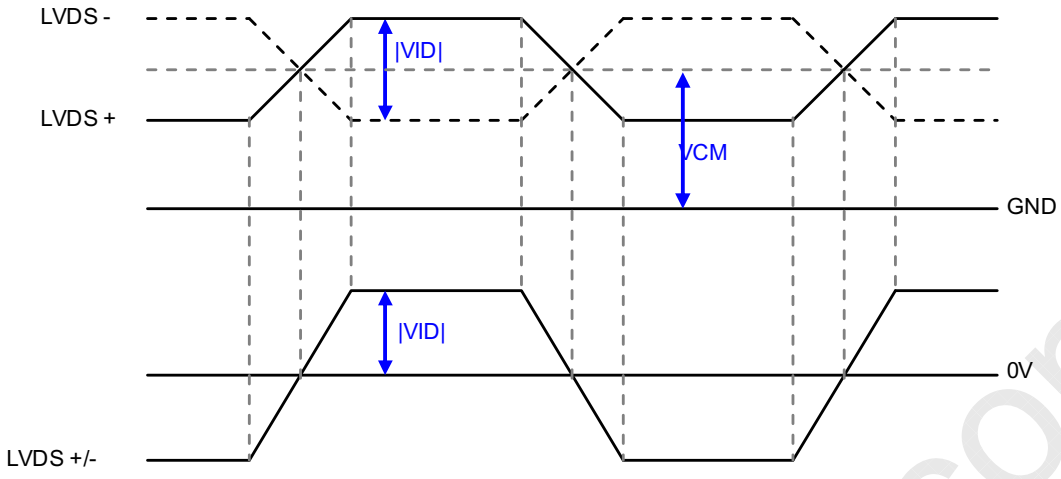
b. Black Pattern

Active Area

c. Horizontal Pattern

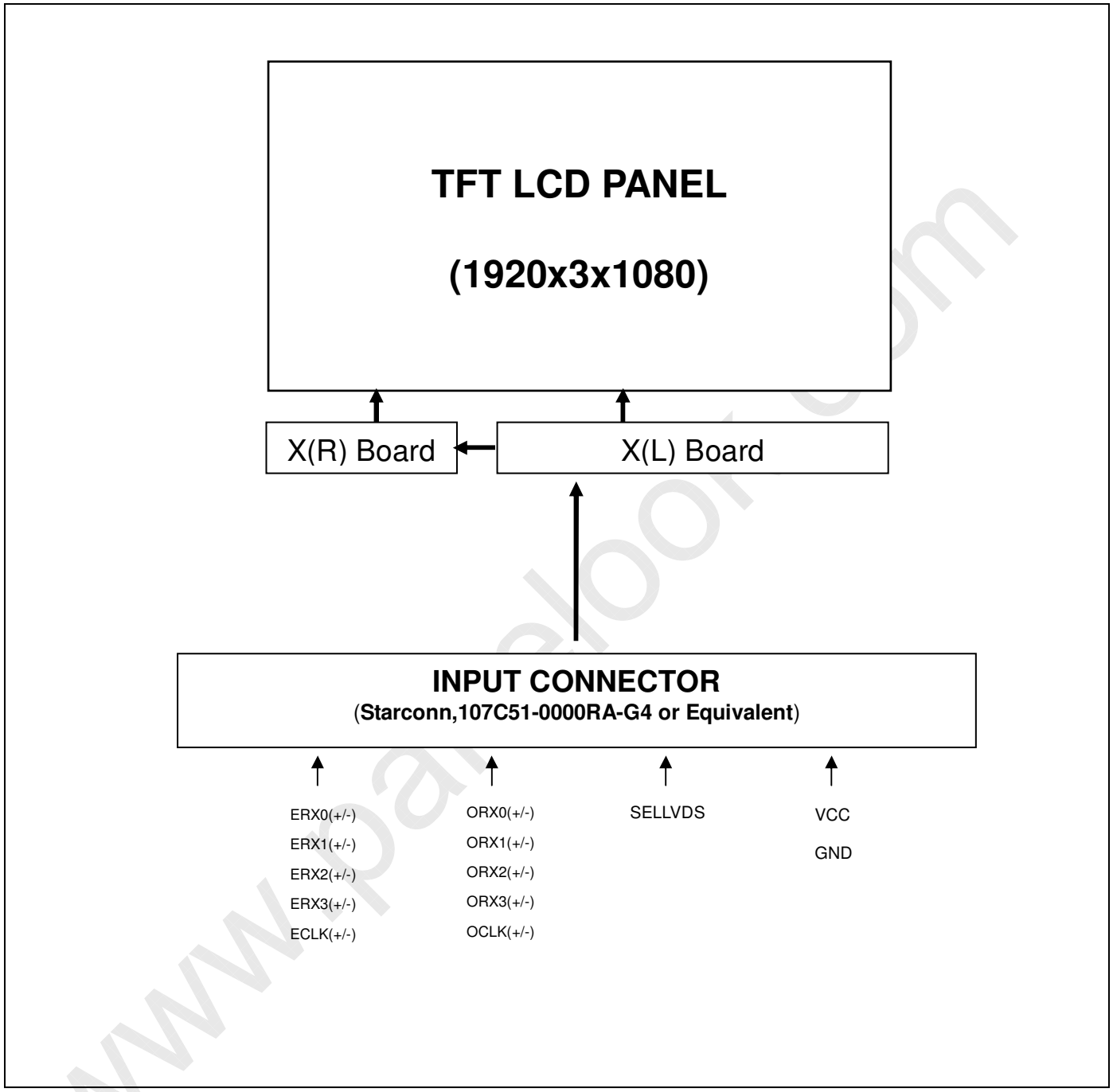


Note (4) The LVDS input characteristics are as follows:



4. BLOCK DIAGRAM

4.1 TFT LCD OPEN CELL



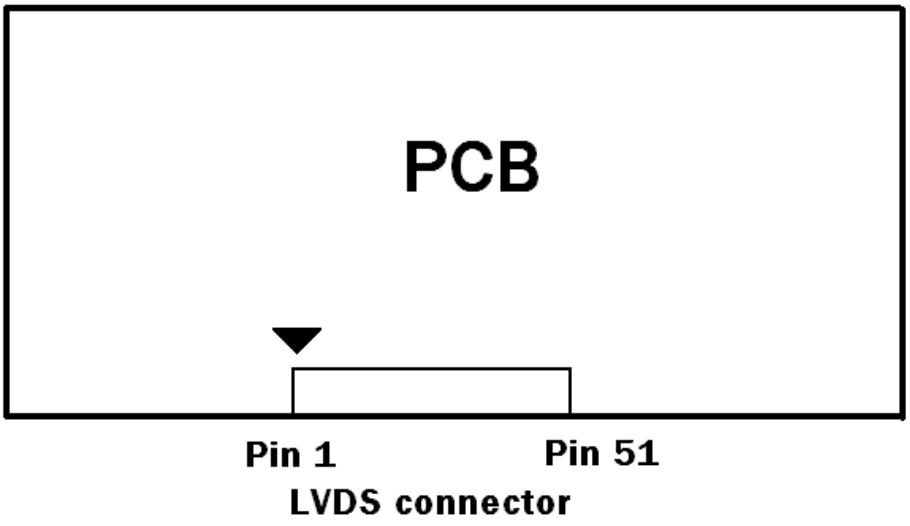
5. INTERFACE PIN CONNECTION

5.1 TFT LCD OPEN CELL

CNF1 Connector Pin Assignment

Pin	Name	Description	Note
1	GND	Ground	
2	N.C.	No Connection	(2)
3	N.C.	No Connection	
4	N.C.	No Connection	
5	N.C.	No Connection	
6	N.C.	No Connection	
7	SELLVDS	LVDS data format Selection	(3)(4)
8	N.C.	No Connection	(2)
9	N.C.	No Connection	
10	N.C.	No Connection	(2)
11	GND	Ground	
12	ERX0-	Even pixel Negative LVDS differential data input. Channel 0	(5)
13	ERX0+	Even pixel Positive LVDS differential data input. Channel 0	
14	ERX1-	Even pixel Negative LVDS differential data input. Channel 1	
15	ERX1+	Even pixel Positive LVDS differential data input. Channel 1	
16	ERX2-	Even pixel Negative LVDS differential data input. Channel 2	
17	ERX2+	Even pixel Positive LVDS differential data input. Channel 2	
18	GND	Ground	
19	ECLK-	Even pixel Negative LVDS differential clock input.	(5)
20	ECLK+	Even pixel Positive LVDS differential clock input.	
21	GND	Ground	
22	ERX3-	Even pixel Negative LVDS differential data input. Channel 3	(5)
23	ERX3+	Even pixel Positive LVDS differential data input. Channel 3	
24	N.C.	No Connection	(2)
25	N.C.	No Connection	
26	GND	Ground	
27	GND	Ground	
28	ORX0-	Odd pixel Negative LVDS differential data input. Channel 0	(5)
29	ORX0+	Odd pixel Positive LVDS differential data input. Channel 0	
30	ORX1-	Odd pixel Negative LVDS differential data input. Channel 1	
31	ORX1+	Odd pixel Positive LVDS differential data input. Channel 1	
32	ORX2-	Odd pixel Negative LVDS differential data input. Channel 2	
33	ORX2+	Odd pixel Positive LVDS differential data input. Channel 2	
34	GND	Ground	
35	OCLK-	Odd pixel Negative LVDS differential clock input	(5)
36	OCLK+	Odd pixel Positive LVDS differential clock input	
37	GND	Ground	
38	ORX3-	Odd pixel Negative LVDS differential data input. Channel 3	(5)
39	ORX3+	Odd pixel Positive LVDS differential data input. Channel 3	
40	N.C.	No Connection	(2)
41	N.C.	No Connection	
42	GND	Ground	
43	GND	Ground	
44	GND	Ground	
45	GND	Ground	
46	GND	Ground	
47	N.C.	No Connection	(2)
48	VCC	Power input (+12V)	
49	VCC	Power input (+12V)	
50	VCC	Power input (+12V)	
51	VCC	Power input (+12V)	

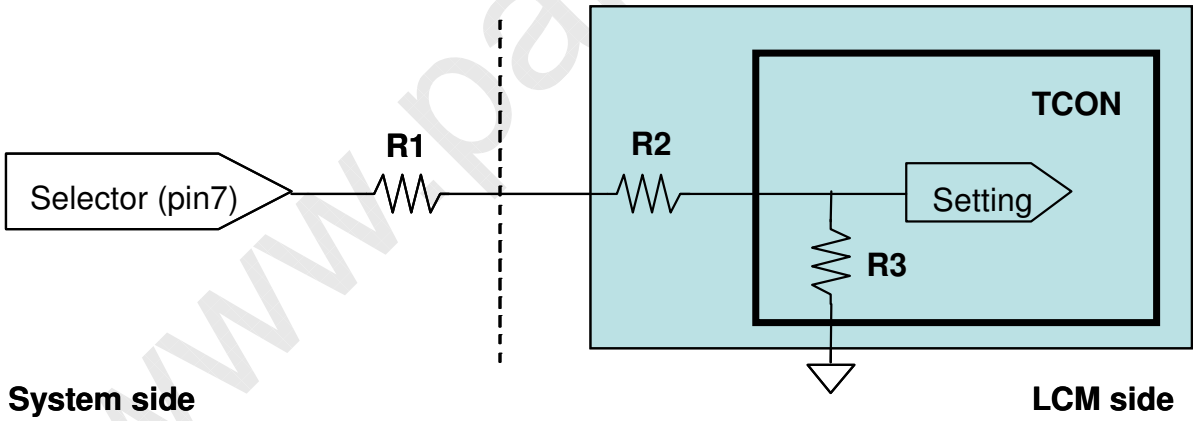
Note (1) LVDS connector pin order defined as follows



Note (2) Reserved for internal use. Please leave it open.

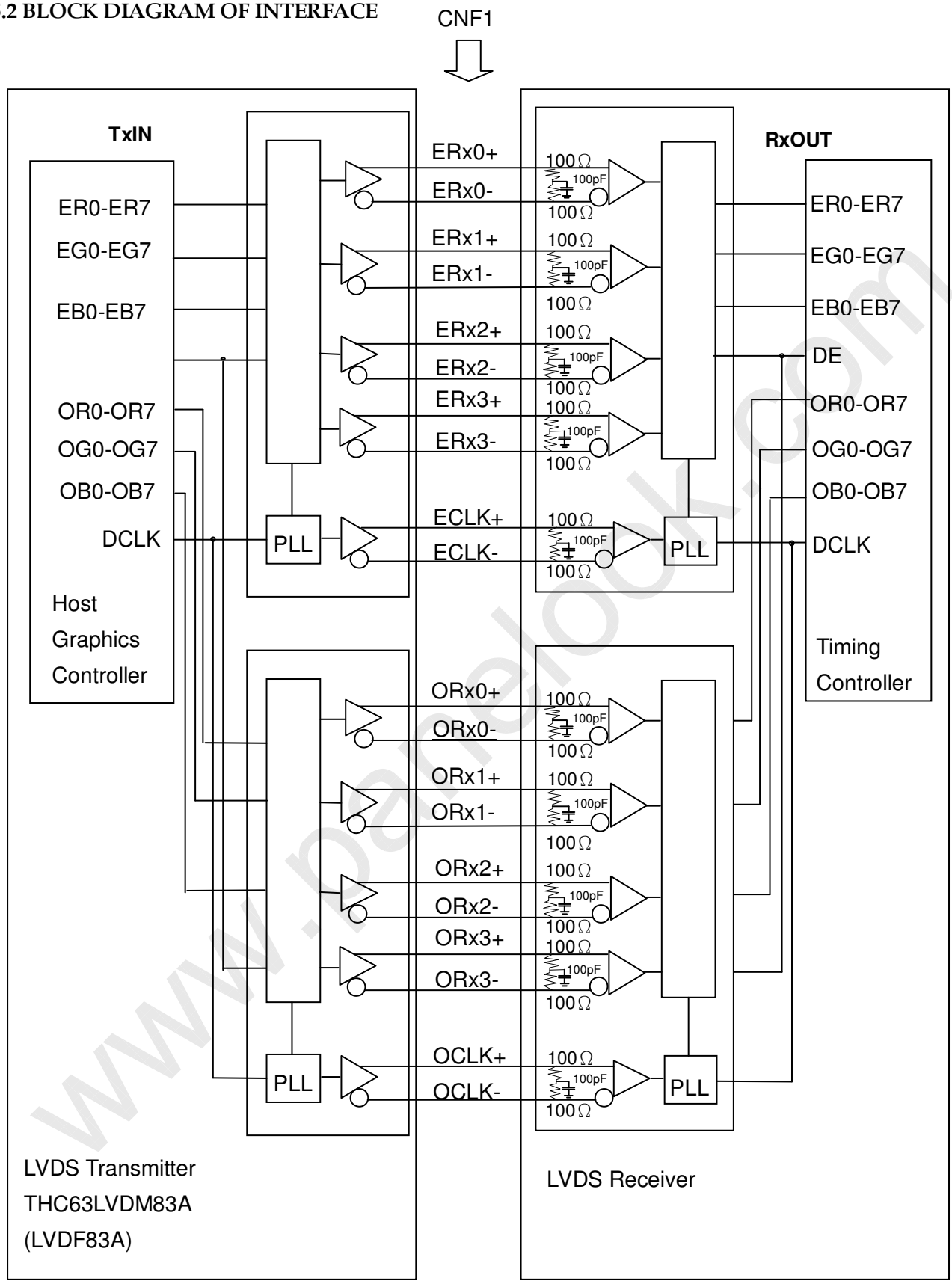
Note (3) Low = Open or connect to GND: VESA Format, High = Connect to +3.3V: JEIDA Format.

Note (4) LVDS signal pin connected to the LCM side has the following diagram. R1 in the system side should be less than 1K Ohm. (R1 < 1K Ohm)



Note (5) Two pixel data send into the module for every clock cycle. The first pixel of the frame is odd pixel and the second pixel is even pixel

5.2 BLOCK DIAGRAM OF INTERFACE



ER0~ER7: Even pixel R data

EG0~EG7: Even pixel G data

EB0~EB7: Even pixel B data

OR0~OR7: Odd pixel R data

OG0~OG7: Odd pixel G data

OB0~OB7: Odd pixel B data

DE: Data enable signal

DCLK: Data clock signal

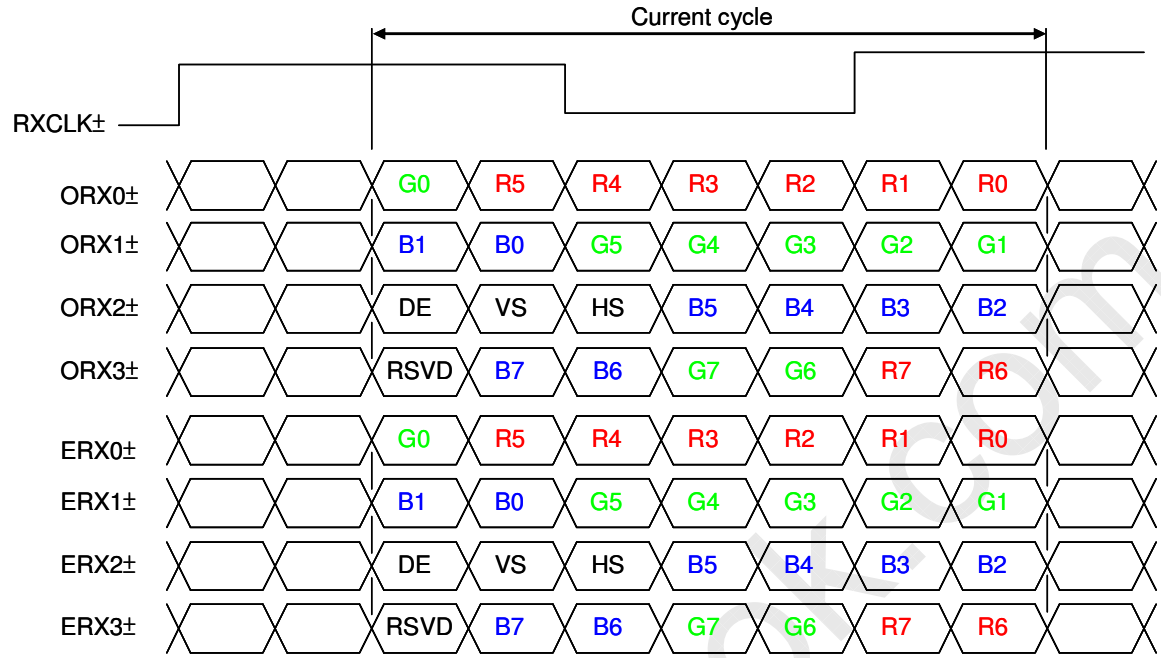
Note (1) The system must have the transmitter to drive the module.

Note (2) LVDS cable impedance shall be 50 ohms per signal line or about 100 ohms per twist-pair line when it is used differentially.

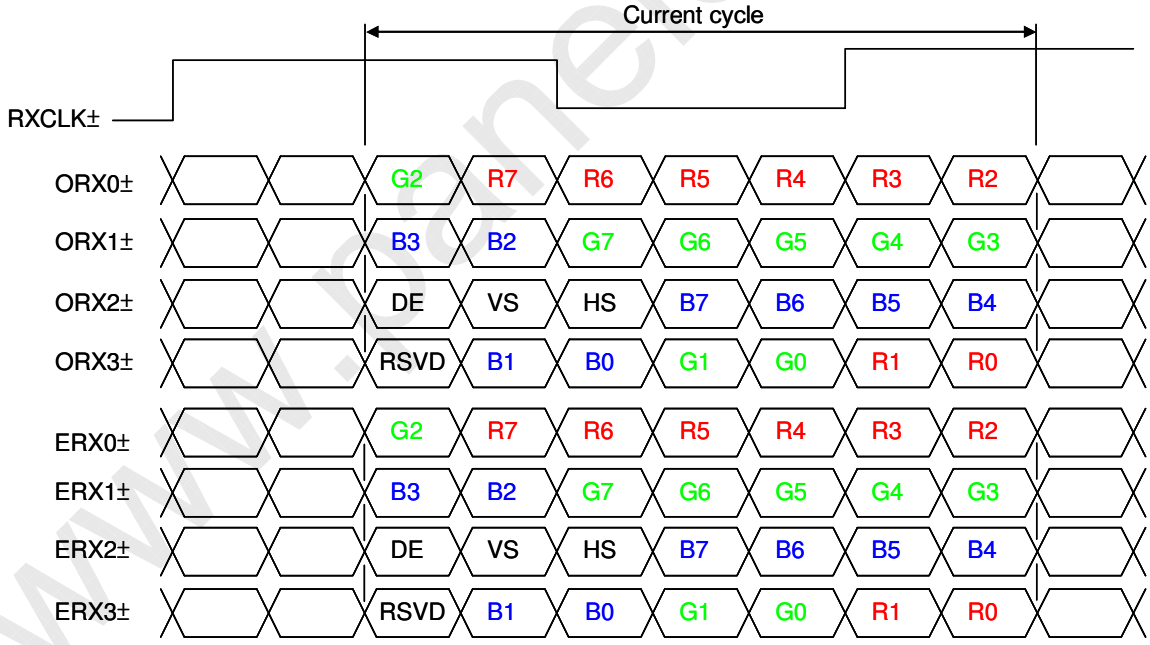
Note (3) Two pixel data send into the module for every clock cycle. The first pixel of the frame is odd pixel and the second pixel is even pixel.

5.3 LVDS INTERFACE

VESA LVDS format：(SELLVDS pin=L or open)



JEDIA LVDS format：(SELLVDS pin=H)



R0~R7: Pixel R Data (7; MSB, 0; LSB)

G0~G7: Pixel G Data (7; MSB, 0; LSB)

B0~B7: Pixel B Data (7; MSB, 0; LSB)

DE : Data enable signal

DCLK : Data clock signal

Notes: (1) RSVD (reserved) pins on the transmitter shall be "H" or "L".

5.4 COLOR DATA INPUT ASSIGNMENT

The brightness of each primary color (red, green and blue) is based on the 8-bit gray scale data input for the color. The higher the binary input, the brighter the color. The table below provides the assignment of the color versus data input.

Color		Data Signal																							
		Red								Green								Blue							
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
Basic Colors	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Cyan	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Magenta	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Gray Scale Of Red	Red(0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(1)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(2)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Red(253)	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(254)	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gray Scale Of Green	Green(0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	Green(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Green(253)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0
	Green(254)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
	Green(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
Gray Scale Of Blue	Blue(0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Blue(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Blue(253)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1
	Blue(254)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0
	Blue(255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

Note (1) 0: Low Level Voltage, 1: High Level Voltage

6. INTERFACE TIMING

6.1 INPUT SIGNAL TIMING SPECIFICATIONS (Ta = 25 ± 2 °C)

The input signal timing specifications are shown as the following table and timing diagram.

Signal	Item	Symbol	Min.	Typ.	Max.	Unit	Note
LVDS Receiver Clock	Frequency	F_{clkin} (=1/TC)	60	74.25	80	MHz	
	Input cycle to cycle jitter	T_{rcl}	—	—	200	ps	(3)
	Spread spectrum modulation range	F_{clkin_mod}	F_{clkin}-2%	—	F_{clkin}+2%	MHz	(4)
	Spread spectrum modulation frequency	F_{SSM}	—	—	200	KHz	
LVDS Receiver Data	Setup Time	Tlvsu	600	—	—	ps	(5)
	Hold Time	Tlvhd	600	—	—	ps	
Vertical Active Display Term	Frame Rate	F_{r5}	47	50	53	Hz	(6)
		F_{r6}	57	60	63	Hz	
	Total	Tv	1115	1125	1135	Th	Tv=Tvd+Tvb
	Display	Tvd	1080	1080	1080	Th	—
	Blank	Tvb	35	45	55	Th	—
Horizontal Active Display Term	Total	Th	1050	1100	1150	Tc	Th=Thd+Thb
	Display	Thd	960	960	960	Tc	—
	Blank	Thb	90	140	190	Tc	—

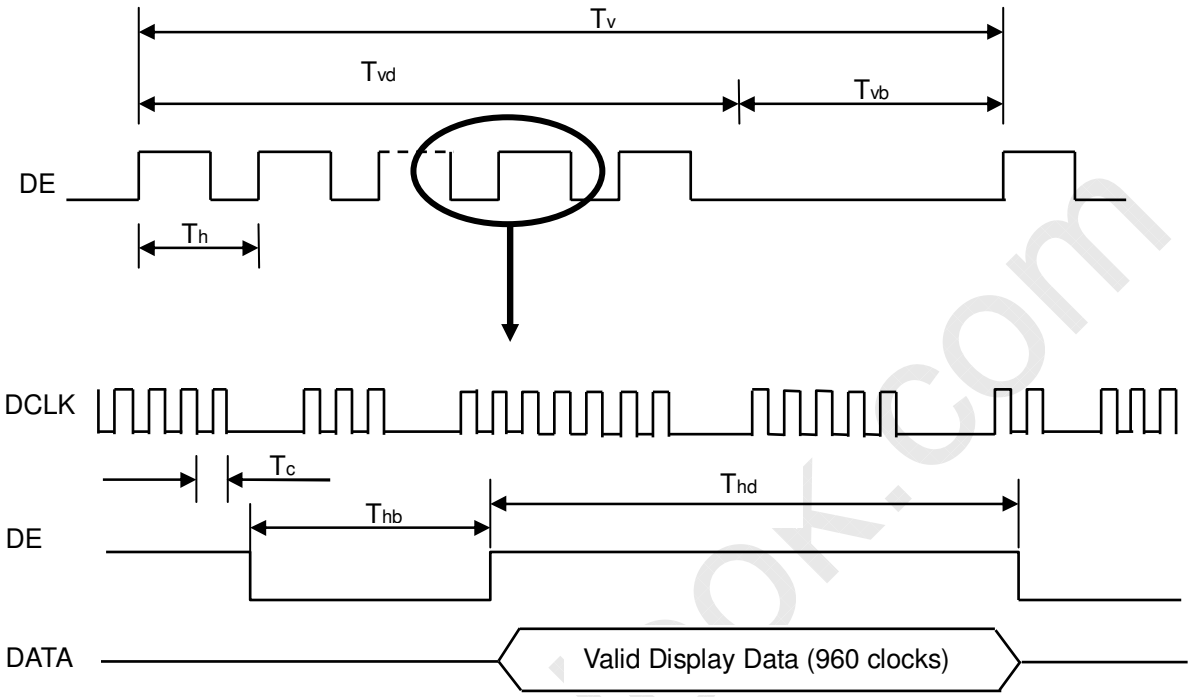
Note (1) Please make sure the range of pixel clock has follow the below equation：

$$Fclkin(max) \geqq Fr6 \times Tv \times Th$$

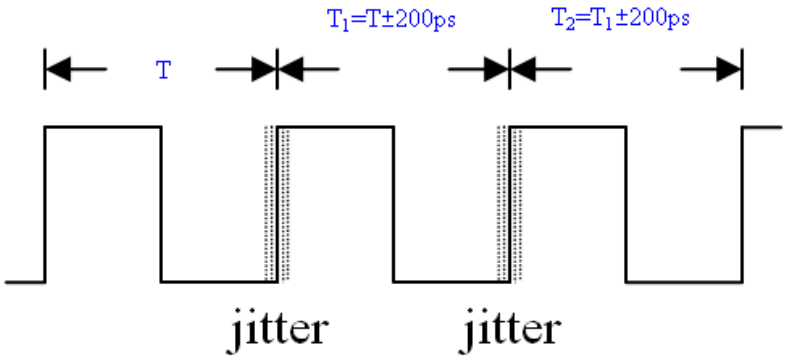
$$Fr5 \times Tv \times Th \geqq Fclkin(min)$$

Note (2) This module is operated in DE only mode and please follow the input signal timing diagram below :

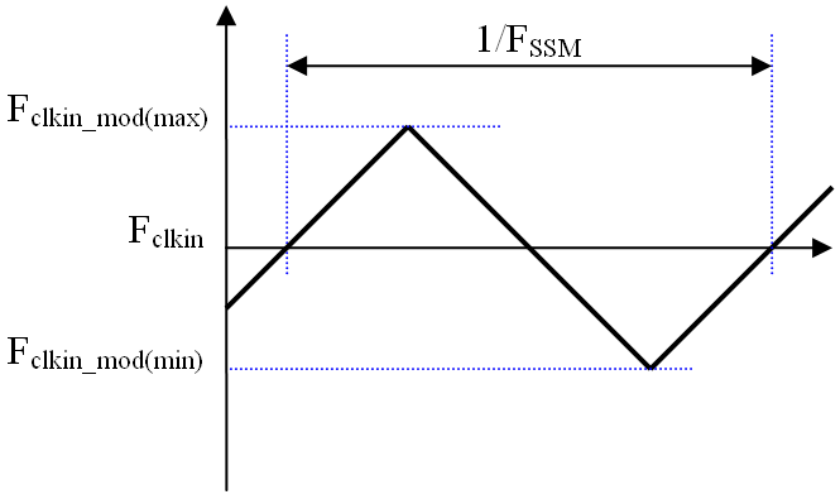
INPUT SIGNAL TIMING DIAGRAM



Note (3) The input clock cycle-to-cycle jitter is defined as below figures. Trcl = I T_1 – TI

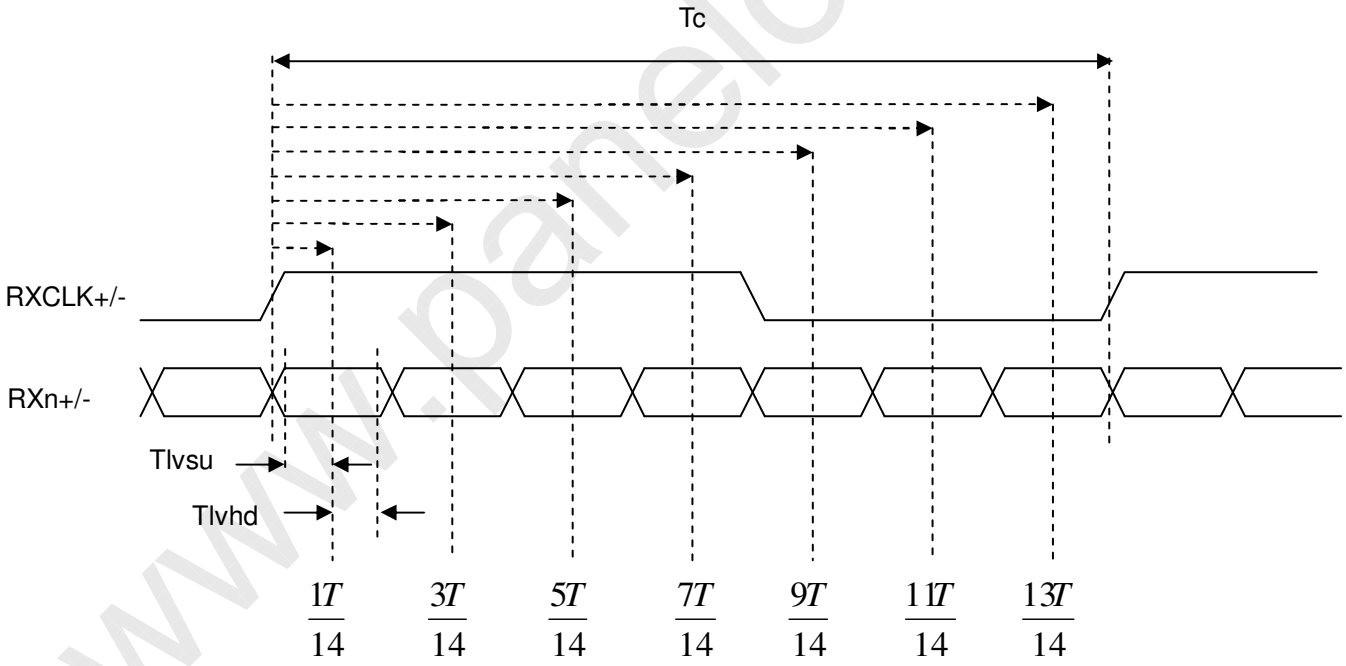


Note (4) The SSCG (Spread spectrum clock generator) is defined as below figures.



Note (5) The LVDS timing diagram and setup/hold time is defined and showing as the following figures.

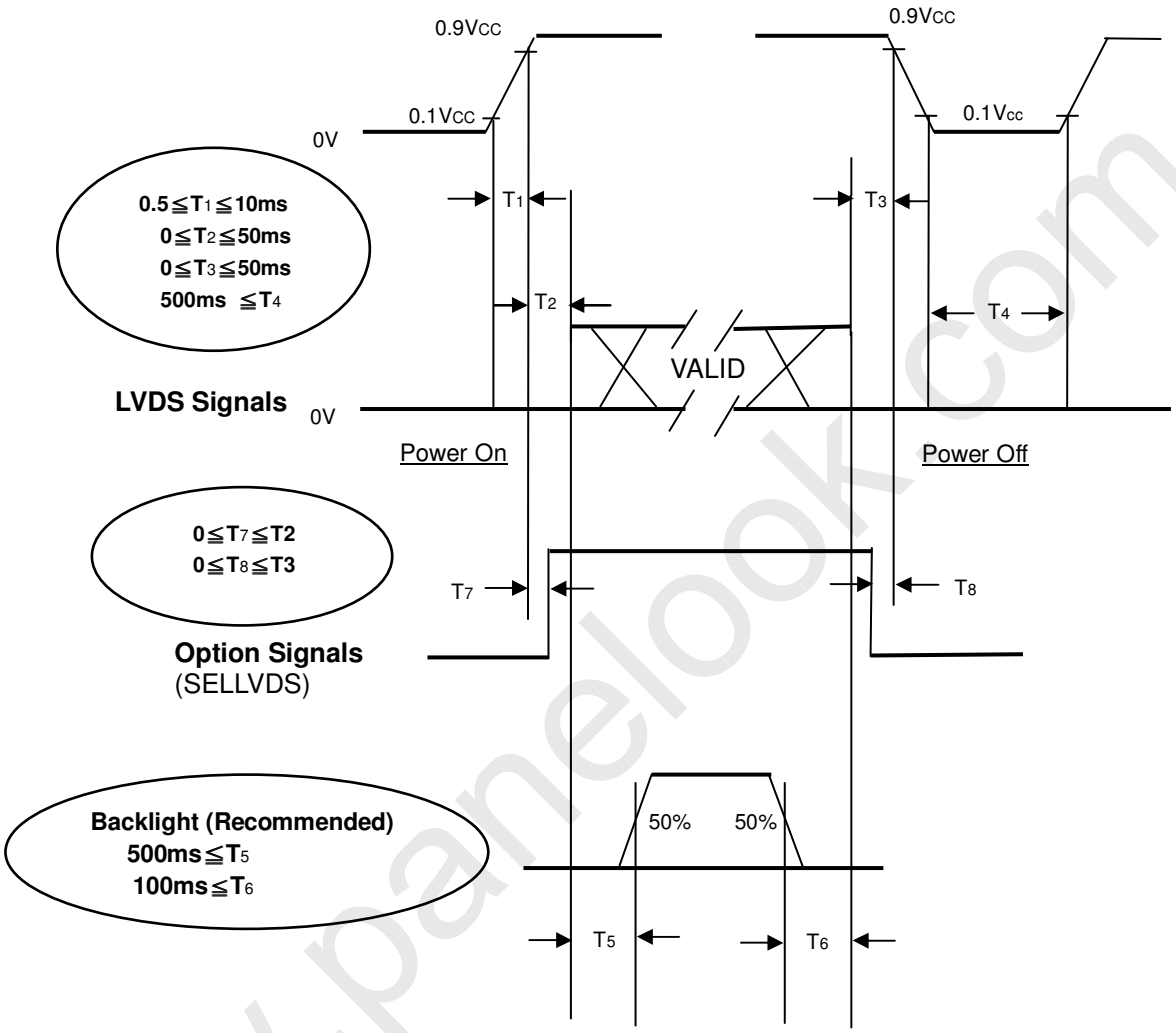
LVDS RECEIVER INTERFACE TIMING DIAGRAM



6.2 POWER ON/OFF SEQUENCE

(Ta = 25 ± 2 °C)

To prevent a latch-up or DC operation of LCD module, the power on/off sequence should be as the diagram below.



Power ON/OFF Sequence

Note (1) The supply voltage of the external system for the module input should follow the definition of Vcc.

Note (2) Apply the LED voltage within the LCD operation range. When the backlight turns on before the LCD operation or the LCD turns off before the backlight turns off, the display may momentarily become abnormal screen.

Note (3) In case of Vcc is in off level, please keep the level of input signals on the low or high impedance. If T2<0, that may cause electrical overstress failure.

Note (4) T4 should be measured after the module has been fully discharged between power off and on period.

Note (5) Interface signal shall not be kept at high impedance when the power is on.

7. OPTICAL CHARACTERISTICS

7.1 TEST CONDITIONS (Based on CMI module V315H3-LE2)

Item	Symbol	Value	Unit
Ambient Temperature	Ta	25±2	◦C
Ambient Humidity	Ha	50±10	%RH
Supply Voltage	V_{CC}	12V	V
Input Signal	According to typical value in "3. ELECTRICAL CHARACTERISTICS"		
LED Current	I_L	120±7.2	mA

7.2 OPTICAL SPECIFICATIONS

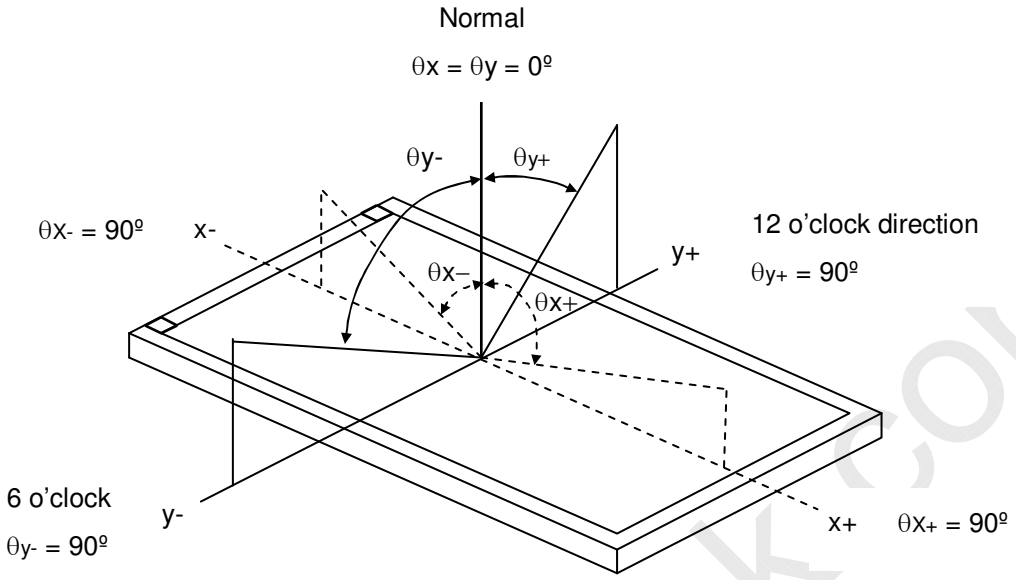
The relative measurement methods of optical characteristics are shown in 7.2. The following items should be measured under the test conditions described in 7.1 and stable environment shown in Note (6).

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Color Chromaticity	Red	Rx	θ_x=0°, θ_Y =0° Viewing angle at normal direction With C Source	Typ.-0.03	(0.654)	Typ+0.03	-	(1),(5)
		Ry			(0.324)		-	
	Green	Gx			(0.293)		-	
		Gy			(0.599)		-	
	Blue	Bx			(0.130)		-	
		By			(0.115)		-	
	White	Wx			(0.312)		-	
		Wy			(0.364)		-	
Center Transmittance		T%	θ_x=0°, θ_Y =0° With CMI Module	-	4.6		%	(1), (7)
Contrast Ratio		CR		4000	6000		-	(1), (3)
Response Time		Gray to gray average	θ_x=0°, θ_Y =0° With CMI Module@60Hz		(8.5)	17	ms	(4)
White Variation		δW	θ_x=0°, θ_Y =0° With CMI Module			1.3	-	(1), (6)
Crosstalk		CT				4.0	%	(1), (8)
Viewing Angle	Horizontal	θ_x+	CR≥20 With CMI Module	80	88	-	Deg.	(1), (2)
		θ_x-		80	88	-		
	Vertical	θ_Y+		80	88	-		
		θ_Y-		80	88	-		

Note (1) Light source is C source and driving voltages are based on suitable gamma voltages.

Note (2) Definition of Viewing Angle (θx, θy):

Viewing angles are measured by Autronic Conoscope Cono-80



Note (3) Definition of Contrast Ratio (CR):

The contrast ratio can be calculated by the following expression.

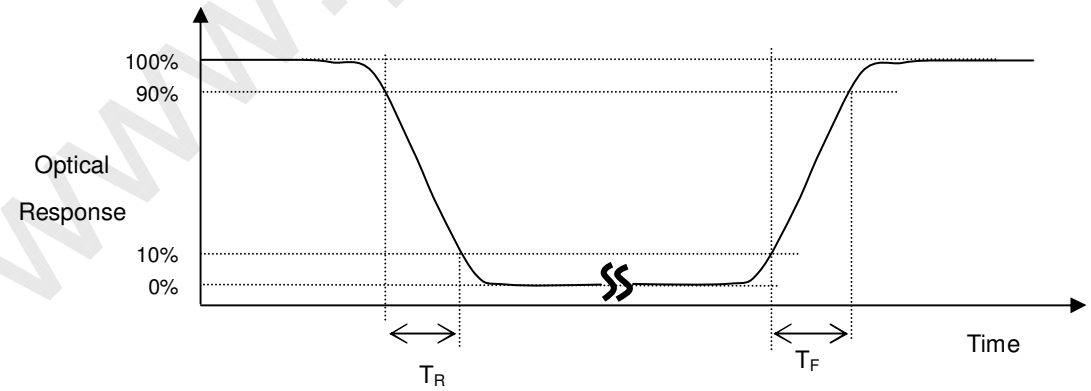
Contrast Ratio (CR) = L255 / L0

L255: Luminance of gray level 255

L 0: Luminance of gray level 0

CR = CR (5), where CR (X) is corresponding to the Contrast Ratio of the point X at the figure in Note (6)

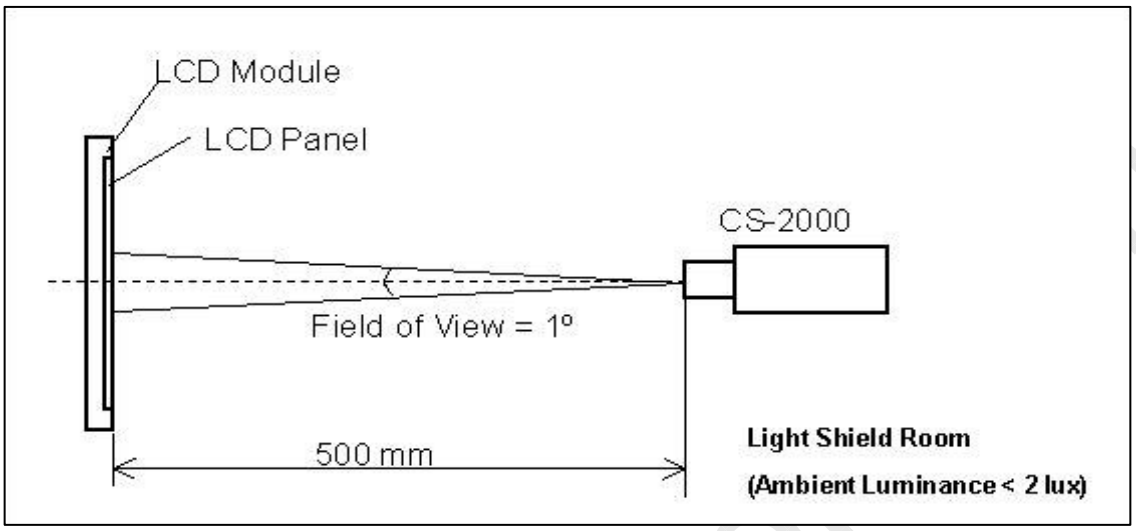
Note (4) Definition of Response Time (Gray to Gray switching time):



The driving signal means the signal of Gray 0, 31, 63, 95, 127,159, 191, 223, 255. Gray to gray average time means the average switching time of gray 0, 31, 63, 95, 127,159, 191, 223, 255 to each other.

Note (5) Measurement Setup:

The LCD module should be stabilized at given temperature for 1 hour to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting backlight for 1 hour in a windless room.

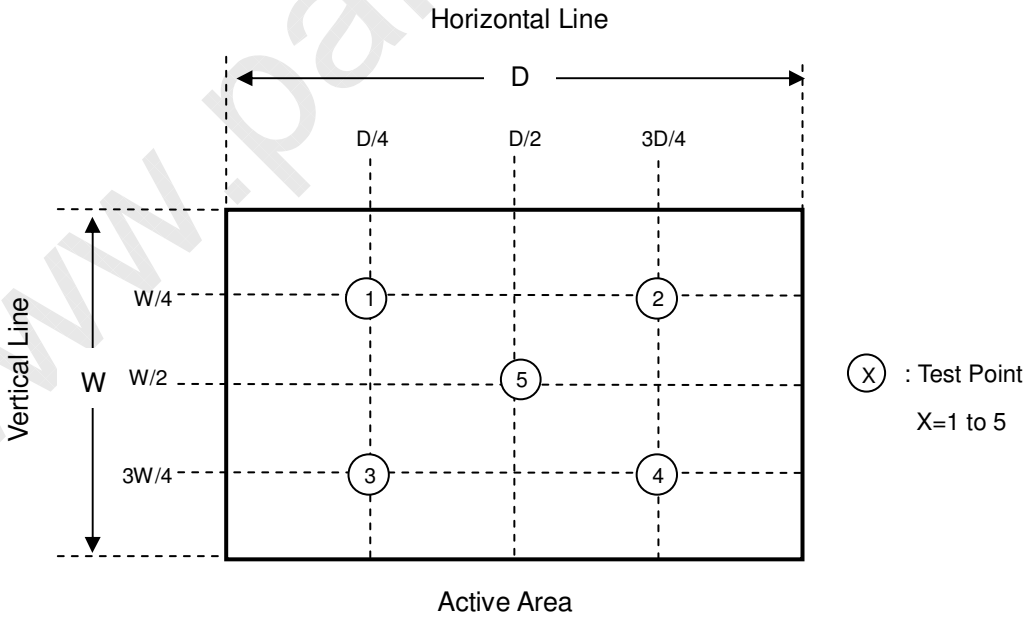


Note (6) Definition of White Variation (δW):

Measure the luminance of gray level 255 at 5 points

δW = Maximum [L (1), L (2), L (3), L (4), L (5)] / Minimum [L (1), L (2), L (3), L (4), L (5)]

where L (X) is corresponding to the luminance of the point X at the figure below.



Note (7)Definition of Transmittance (T%):

Module with suitable gamma voltage signal input.

$$\text{Transmittance} = \frac{\text{Luminance of LCD module}}{\text{Luminance of backlight}} * 100\%$$

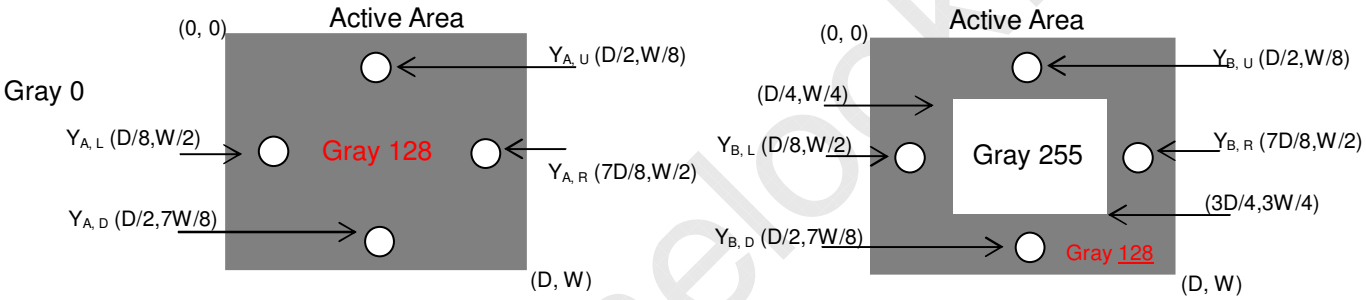
Note (8) Definition of Cross Talk (CT):

$CT = | Y_B - Y_A | / Y_A \times 100\ (\%)$

Where:

Y_A = Luminance of measured location without gray level 255 pattern (cd/m^2)

Y_B = Luminance of measured location with gray level 255 pattern (cd/m^2)



8. PRECAUTIONS

8.1 ASSEMBLY AND HANDLING PRECAUTIONS

(1) Do not apply rough force such as bending or twisting to the product during assembly.

(2) To assemble backlight or install module into user's system can be only in clean working areas. The dust and oil may cause electrical short or worsen the polarizer.

(3) It's not permitted to have pressure or impulse on the module because the LCD panel will be damaged.

(4) Always follow the correct power sequence when the product is connecting and operating. This can prevent damage to the CMOS LSI chips during latch-up.

(5) Do not pull the I/F connector in or out while the module is operating.

(6) Use a soft dry cloth without chemicals for cleaning, because the surface of polarizer is very soft and easily scratched.

(7) It is dangerous that moisture come into or contacted the product, because moisture may damage the product when it is operating.

(8) High temperature or humidity may reduce the performance of module. Please store this product within the specified storage conditions.

(9) When ambient temperature is lower than 10°C may reduce the display quality. For example, the response time will become slowly.

8.2 SAFETY PRECAUTIONS

(1) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contact with hands, skin or clothes, it has to be washed away thoroughly with soap.

(2) After the product's end of life, it is not harmful in case of normal operation and storage.

9. MECHANICAL CHARACTERISTIC